PATENT SPECIFICATION
NO DRAWINGS

822,614

Date of Application and filing Complete Specification May 25, 1956.
No. 16223/56.
Application made in United States of America on June 23, 1955.
Complete Specification Published Oct. 28, 1959.

Index at acceptance: —Classes 28(1), B, L; and 49, B1(A:B:C:H:J:L:T), B6(C:F).
International Classification: —A23d, g, b.

COMPLETE SPECIFICATION

Fat Compositions and preparation thereof

We, GENERAL FOODS CORPORATION, a corporation organised under the laws of the State of Delaware, United States of America, of 250 North Street, White Plains, New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to powdered free-flowing fat composition and to a process for preparing the same.

Powdered fat compositions consisting generally of small particles of fat encased in a coating of edible, water-soluble solids, and their use in various food products such as cakes, pastries, bread and toppings are well known. It has been proposed, for example, to dry emulsions of shortening fat and non-fat milk solids either by spray drying or drum drying to provide a powdered free-flowing shortening composition. The use of protein materials such as buttermilk solids, whey solids, whole eggs, egg yolks, gelatine, or hydrolysed soy protein gums such as cellulose ethers, gum tragacanth, gum acacia; and carbohydrates such as starches and sugars; either individually or in combination, as substitutes for the encapsulating non-fat milk solids has also been proposed. Furthermore, improved powdered fat products have been prepared employing "emulsifiers" such as lecithin, partial esters of glycerol and the higher fatty acids, and partial esters of sorbitol and the higher fatty acids. These powdered fat compositions offer the advantages of ease of handling and of incorporation with other dry free-flowing ingredients during the preparation of various food products. They have enjoyed a fair amount of commercial success. Their use has largely been limited, however, to products wherein the rate and amount of fat released on addition of an aqueous liquid is of relatively little importance. For example, a large potential use of powdered fat compositions is in prepared cake mixes. The present mode of incorporating shortenings into these mixes roughly parallels that of the housewife which involves the step of creaming the shortening with one or more of the dry ingredients such as sugar or flour. This creaming step is necessary to ensure an adequate distribution of the shortening throughout a cake batter prepared from such a mix.

It is obvious that the use of powdered shortenings would provide a great advantage to a cake mix manufacturer, by eliminating the costly and time-consuming creaming operation and at the same time provide for an improved distribution of shortening throughout the resulting cake batter. However, when the hitherto available powdered shortenings are employed in a cake mix, the quality of a cake prepared from such a mix is extremely poor and the reason generally attributed for this poor quality cake is the difficulty with which the fat portion of the powdered fat composition is released to be effective in cake baking. For this reason, attempts have been made to improve the rate at which the shortening is released on contact with aqueous liquids. However, for various reasons, none of these attempts has been completely successful and the use of powdered shortenings remains restricted to those areas where the rate of fat release is relatively unimportant.

Powdered fat compositions for use in preparing whipped topping are also well known. These materials offer the advantage of ease of handling and of freedom from spoilage on storage for long periods of time. However, because these products generally do not have the texture and appearance of natural whipped cream, they have not enjoyed a large degree of commercial success. More important, however, these materials usually perform in an inconsistent manner, providing in many cases little or no overrun on whipping.

It is therefore an object of the present invention to provide a powdered, free-flowing fat composition which will effectively release its fat content upon contact with aqueous liquids.

Still another object of this invention is to

provide a powdered, free-flowing fat composition which on reconstitution with milk or water and whipping will provide a whipped topping similar to whipped cream in texture and appearance and superior thereto in respect to stability.

In accordance with the present invention, there is provided a powdered, free-flowing fat composition comprising a dried emulsion of a fat and the partial ester of an edible glycol and a higher saturated, fatty acid in a matrix of hydrophilic encapsulating solids or a mixture of these solids and carbohydrates or sugars.

The present invention also provides a method of making powdered, free-flowing fat composition which comprises melting the fat together with said partial ester, and with lecithin if used, emulsifying the same in a solution of the encapsulating solids, or a mixture of these solids and carbohydrates or sugars and then effecting spray drying.

The present invention yet further provides a powdered, free-flowing fat composition comprising 30 to 80 parts by weight of fat, 0.5 to 5 parts by weight of hydroxylated lecithin, 5 to 30 parts by weight of non-fat milk solids, 2 to 35 parts by weight of sucrose and 3 to 20 parts by weight of propylene glycol monostearate. Preferably, the encapsulating solids are proteinaceous in nature.

In this manner a powdered free-flowing fat composition is provided which is suitable for a wide range of uses including cakes, pastries, breads, toppings and spreads. On incorporation of these compositions in the dry mixes, a mix which may be reconstituted in a very short time and with a minimum of effect is obtained and which, at the same time, provides a final food product of exceptionally high quality.

It has further been found that the addition of various lecithins, and their hydroxylated or phosphorylated derivatives, to the above fat composition provides for greater improvement in the rate of fat release on reconstitution, and improved quality in the final food product. The term lecithin, as used herein is intended to mean phosphatide compositions derived from materials such as soybeans, maize, cottonseed, peanuts, egg yolks or liver, containing lecithin in varying degrees of purity. Also, phosphatides modified by hydroxylation or phosphorylation may be employed. Hydroxylated soy lecithin is preferred.

The benefits of this invention are particularly apparent in powdered fat compositions containing a shortening fat, non-fat milk solids and sugar. In the preparation of these materials, the process which is generally employed requires that an emulsion be made of the fat in an aqueous solution of the milk solids and sugar. This emulsion is then dried by any suitable means such as spray drying or drum drying. Where the material is drum dried, the final flaked product is comminuted to provide a powdered, free-flowing shortening. In the case of spray drying, however, the final product is in a form which is particulate and free-flowing. The particles in this latter case are generally considered to be hollow spheres consisting of a matrix of the non-fat milk solids and sugar in which a fine distribution of fat globules is embedded.

The esters of a glycol and a higher fatty acid which may be employed according to this invention include propylene glycol mono- and distearate, mono- and dipalmitate, mono- and dilaurate, mono- and dimyristate, mono- and diricinoleate and mono- and dibehenate. Other glycols may be employed as the glycol portion of the ester, but the presence of a monoester is essential. These included the polyoxethylene glycols, the butylene glycols and di-propylene glycol, and include the polymers of the various simple glycols. While all the glycols mentioned here will function according to the invention in bringing about a rapid release of fat from the shortening composition on contact with aqueous liquid, propylene glycol is preferred as being the most effective. Considering now the preferred esters of propylene glycol and a higher fatty acid, mixtures of fatty acids may be employed. For example, an ester prepared by reacting propylene glycol with commercial "triple pressed" stearic acid which contains approximately 45% stearic acid and 55% palmitic acid has been found to function in an acceptable manner. Also, esters prepared by reacting the propylene glycol with fatty acids from natural animal and vegetable fats such as lard or hydrogenated cotton seed oil, have been found to be suitable but less preferred. Best results have been obtained according to this invention through the use of substantially pure propylene glycol mono-stearate and this material is preferred. The level of the glycol fatty acid ester employed in the composition of this invention will, of course, vary with the nature and type of ester employed and the intended end use of the compositions.

Although relatively low levels of glycol fatty acid esters in the dry fat composition of the present invention provide improved results when such compositions are employed in a cake mix or a powdered topping composition, it is preferred that the levels of such glycol esters contained in the fat composition be of the order of 10% to 16% of such composition. Also, the glycol esters may be employed in the fat composition with other emulsifiers such as the mono- and diglycerides higher fatty acid esters to provide the desired improvement in cake mixes or toppings.

The encapsulating solids which may be employed according to this invention include all of those materials well known in the art. The various hydrophilic colloids, such as non-fat milk solids, whey solids, sodium caseinate, soy protein derivatives, egg albumen, gelatine, hydrolyzed fish protein, buttermilk solids,

whole eggs and egg yolks may be employed. Similarly, various gums such as the cellulose ethers, pectin, algins, gum arabic and gum tragacanth may be employed. In conjunction with the above-mentioned materials, either alone or mixtures thereof, carbohydrates, such as flour, raw or gelatinized starches from various sources such as maize, tapioca, potato, sago, sorghum, rice, waxy maize, wheat and sugars, such as sucrose, dextrose, corn syrup solids and lactose may be employed. These materials may be employed in any suitable combination. It is preferred to employ, according to this invention, a mixture of non-fat milk solids from fresh skim milk and sucrose as the encapsulating solids.

Shortening fat constituents of these compositions may be any of those normally employed in the preparation of the particular food product to which the final composition will be directed. For example, in preparing these shortening compositions for use in cakes or other baked goods, the usual shortenings such as lard, modified lard, hydrogenated cotton seed, coconut, peanut and corn oil, butter, oleomargarine, or any combination of food oils, semi-solid or solid fats, may be employed. These materials may have the melting point range, saponification value, iodine number, and other characteristics found to be desirable in the preparation of the particular baked goods desired. On the other hand, the characteristics or nature of the fat to be employed in a whippable topping composition may vary from that desired in a baked product.

In the preparation of the powdered fat compositions of this invention, the fatty constituents are melted together with the selected glycol fatty acid ester and emulsified in a warm solution of the encapsulating solids. The mixture is then further emulsified by a suitable homogenizer and the emulsion is dried, as by roller drying or spray drying, preferably by spray drying.

It has been found desirable where milk solids are employed to limit the amount of heat which is applied to the composition after the milk solids have been added. The preferred procedure, therefore, requires that the fatty materials be heated to a temperature of approximately 160° F. and that the milk solids and sugar solution be heated to from 130° F. to 140° F. The fatty materials and milk solids are then immediately mixed and emulsified, the resulting temperature of the emulsion being roughly 150° F. This emulsion is then immediately cooled to approximately 100° F. prior to drying. The skim milk solids which are employed are preferably those from fresh skim milk, and drying temperatures during drying are preferably held to a minimum. Spray drying, of course, permits the use of minimum temperatures during drying.

The compositions of this invention have been found to be useful in a variety of food products. As aforementioned, the ability of these compositions to release the fat component quickly and effectively has a particular advantage in the case of prepared culinary mixes, and more particularly, those directed to the preparation of a shortening cake. Not only do the powdered shortenings of this invention provide the expected benefit of ease of incorporation with the other dry ingredients during manufacturing of the mix but also the quality of the final cake is greatly improved. This improved quality apparently is brought about by the improved manner in which the shortening fat is released during batter preparation and also because of a more favourable fat distribution throughout the prepared batter.

Furthermore, a batter can be prepared from these improved cake mixes with much less difficulty and in a shorter time than with conventional mixes. For example, conventional mixes require the addition of liquid ingredients in at least two separate portions during batter preparation. Also, from 3 to 5 minutes of mixing by machine or from 5 to 8 minutes of strenuous beating by hand is required to fully develop the cake batter. On the other hand, the improved mixes of this invention are prepared by initially adding the total amount of liquid ingredients to the dry mix, followed by from 1 to 1½ minutes of simple stirring by hand to provide a completely developed batter. This reduction in time and effort required to fully develop a cake batter provides a significant improvement over conventional mixes.

The improved results attributed to the powdered fat composition of this invention are not restricted to baked goods. For example, an excellent whipped cream substitute may be prepared by the simple addition of milk or water to the dry fat composition followed by vigorous beating in a household mixer for from 2 to 5 minutes. In this manner, a whipped topping similar in many respects to whipped cream is provided. This topping has improved stability and texture characteristics over those of the prior art including whipped cream. The degree of overrun is increased and the work required to provide a whip is decreased. In addition, where the usual prior products require water for reconstitution, the present compositions can be successfully reconstituted and whipped with fresh whole milk. This is a decided improvement, because the fat of the whole milk formerly interfered with the whipping of toppings of this type, resulting in decreased overrun and difficulty in whipping.

Following are specific examples of powdered fat compositions of this invention, and compositions in which they can be employed in concert with other materials.

EXAMPLE 1.

Ingredients	Parts by Weight
Hydrogenated cotton seed oil 30° C. congeal point	36
Propylene glycol monostearate	13
Hydroxylated soy lecithin	1
Sucrose	25
Non-fat milk solids	25

In preparing a powdered fat from these ingredients, the hydrogenated cotton seed oil, propylene glycol mono-stearate and lecithin are melted together and mixed at a temperature of 160° F. At the same time, the sucrose and non-fat milk solids are dissolved in 100 parts by weight of water and heated to 140° F. The two mixtures are combined with simple mixing and homogenized in a Manton-Gaulin homogenizer at 500 lbs. per sq. in. (gauge). The Manton-Gaulin homogenizer is a two-stage positive pressure homogenizer with provision for varying the pressure on homogenizing valves in each stage. The original valve- type homogenizer was invented by Gaulin and consists of a valve and a high-pressure pump. The Manton-Gaulin homogenizer is a modification of this consisting of a second stage in a second valve. The emulsion after homogenization is cooled to below 100° F. and then fed directly to a spray drier operating at an inlet temperature of 380° F. to 390° F. and an outlet temperature of about 220° F.

The spray dried is of a conventional design and comprises a cylindrical tower 10 feet in diameter and 30 feet in height. The drier is of the cocurrent type wherein warmed drying air is introduced at the top of the drier and removed at the bottom. The drier has a spray drying nozzle, ST—48—27 described fully in "Industrial Spray Nozzles," published by Spraying Systems, Incorporated, 1953, Catalogue No. 24, pages 25—27. The nozzle is located in the center of the drier, approximately 2.5 feet from its top and adapted to direct the atomized solution downwardly in a conical spray pattern. An air sweeping device within the drier is preferably employed to maintain the drier walls free from the dried material.

The emulsion is fed to the nozzle at a pressure of approximately 500 lbs. per sq. in. (gauge). The resulting particulate free-flowing powder is preferably cooled immediately to 35° F. and thereafter stored at room temperature.

EXAMPLE 2.

In preparing a whipped topping from the material in Example 1, 4 ozs. of the powdered fat composition is combined with one cup of milk at refrigerator temperature and whipped in a household mixer at high speed for 2 to 3 minutes. The resulting product has an overrun of over 200% and upon flavoring with a small quantity, for example one teaspoonful, of vanilla extract, has the texture, taste, and appearance of natural whipped cream. In addition, the whipped product is extremely stable and remains substantially unchanged for a period of 24 to 48 hours in a refrigerator. Furthermore, if the whip has collapsed slightly on storage, it may be rewhipped with no adverse effects.

EXAMPLE 3.

A highly acceptable frozen dessert very similar to ice cream is provided by placing the whipped product of Example 2 together with a teaspoonful of a suitable flavoring material into a tray and placing the same in a freezing compartment of a household refrigerator for several hours. Thus, any flavoring material may be used to provide whatever flavor may be desired. Therefore, flavors such as vanilla extract, chocolate, strawberry, apple or any other desired fruit extract may be used. Unlike the usual frozen desserts, this material does not require mixing during frezing and the final frozen dessert is free from undesirable ice crystallization and has a fine, smooth texture.

EXAMPLE 4.

The powdered fat of Example 1 is employed very successfully as a shortening ingredient in prepared cake mixes. Typical formulas of such mixes are as follows :

Ingredients	% by Wt. White	% by Wt. Yellow	% by Wt. Devil's Food
Sucrose	33.4	36.0	35.0
Cake flour	36.5	35.0	31.0
Sodium chloride	0.7	0.7	0.7
Sodium bicarbonate	0.6	0.6	1.1
Sodium acid pyrophosphate	1.0	1.0	0.6
Powdered fat composition of Example 1	26.0	26.0	26.0
Cocoa	—	—	5.4
Dextrose	2.0	—	—

In preparing the above mixes, the ingredients are thoroughly mixed together by any of the usual means employed in intimately mixing dry powders. In preparing a cake batter from these mixes, 20 ozs. of the mix is added to one cup of water and eggs. In the case of the Yellow and Devil's Food mixes, two whole eggs are employed for each 20 oz. of mix, while in the White cakes only two egg whites are employed.

The development of batter here is extremely simple. After the mixed ingredients have

been thoroughly wetted with the aqueous ingredients, which usually takes about 30 seconds, an additional one minute of simple stirring by hand with a spoon is sufficient to fully develop a cake batter. The mixing can also, of course, be carried out with the usual household mixer, batter development again requiring only approximately 1 minute.

The batter is then divided between two 8" layer cake tins and baked at 375° F. for 20—30 minutes. Where the batter is prepared by hand, the resulting layers have an extremely good volume ranging on the average from 1200 cc. in a White cake to 1300 cc. in the Yellow cake and 1350 cc. in the Devil's Food cake. The batters prepared by machine mixing result in cakes having a volume averaging 50 cc. greater. In general, this amounts to an increase of from 50 to 100 cc. in volume over cakes made from conventional mixes. Furthermore, these cakes are of an exceptionally high grade based on their shape, colour, texture, grain and eating quality.

An additional important advantage of these mixes is found after storage of the mixes for several months. Where conventional mixes lump badly, with consequent increased difficulty in batter preparation, the mixes here described retain their free-flowing characteristics over long periods of storage and remain as easy to prepare as they were originally.

EXAMPLE 5.

Following are formulas of powdered fat compositions found particularly useful as shortenings in cake mixes.

	A	B
Hydrogenated cotton seed oil 30° C. congeal point	43.0	43.0
Propylene glycol monostearate	16.0	16.0
Hydroxylated soy lecithin	1.0	1.0
Sucrose	30.0	34.0
Non-fat milk solids	8.0	—
Sodium caseinate	2.0	6.0

In these two examples, the milk solids have been replaced either partially or completely with sodium caseinate. The emulsions are prepared and dried as in Example 1 and the powdered fat product is employed as in Example 4.

EXAMPLE 6.

A mayonnaise is prepared by combining 80 gms. of the powdered fat product of Example 1 with 25 ml. of vinegar, 0.5 g. of salt, 35 mls. of water, 1 g. of mustard, 5 g. of dried egg yolk, and mixing these for one minute. In this manner, a mayonnaise of superior texture, appearance and eating qualities is obtained. As an alternative procedure, the egg yolk solids and salt together with an alginate stabilizer are incorporated into the emulsion of Example 1 prior to drying. In this case, an emulsion having the following compositions is employed.

Ingredients	%
Hydrogenated cotton seed oil (26° F. congeal point)	52
Propylene glycol monostearate	12
Egg yolk	12
Propylene glycol alginate	1
Sugar	5
Salt	4
Non-fat milk solids	10
Lecithin, hydroxylated soy	2
Sodium caseinate	2

An emulsion of these materials is prepared and dried according to the procedure outlined in Example 1. In this manner, a dry, fat containing, mayonnaise mix is provided which on addition of vinegar and water and a small amount of stirring provides a mayonnaise product of superior quality.

EXAMPLE 7.

A highly acceptable Hollandaise sauce may be prepared from the mayonnaise composition of Example 6 by the addition of a butter flavour, colour, and appropriate spices either to the emulsion prior to drying or to the mixture during reconstitution with either milk or water as described hereinbefore, in an amount of one cup for 4 oz. of the powdered fat composition. In use, the mixture is heated slightly and applied to the desired food product, such as asparagus. The sauce thus prepared has the flavor and appearance of conventional Hollandaise sauces and is very simply prepared. Further, this sauce may be cooled, stored and reheated with little danger of separation of ingredients such as occurs with conventional Hollandaise sauces.

EXAMPLE 8.

A spread for sandwiches, canapés, hors d'oeuvres, and the like is prepared from the powdered fat product of Example 1 by the addition of water and suitable spices or other flavouring materials, among others, vinegar, salt, mustard, dried egg yolk, or any butter flavour such as butyrates or caproates. A margarine type spread results from mixing 125 g. of the product of Example 1 with 35 ml. of water. A simple flavoured spread is prepared by thoroughly mixing 180 g. of a product of Example 1 with 150 mls. of water and 50 ml. of expressed onion juice.

EXAMPLE 9.

A pudding of superior texture somewhat resembling a custard type pudding is prepared by adding the powdered fat product of Example 1 to a conventional cooked starch pudding mix in a ratio of 1 part by weight of powdered fat to 7.5 parts by weight of the pudding mix. The pudding is then prepared in the ordinary manner by adding water, cooking and chilling.

EXAMPLE 10.

A dry mix for use in preparing flavoured milk shakes is prepared according to the following formula ;

Ingredient	Gms.
Powdered fat composition of Example 1	25
Sucrose	75
Cocoa	20
Powdered barley malt flavouring	1.5
Dextrose	3.5

20 gms. of this composition is added to 1 cup of milk and blended in a mixer for a short time to provide a full bodied milk shake, similar to those prepared with ice cream.

WHAT WE CLAIM IS :

1. A powdered, free-flowing fat composition comprising a dried emulsion of a fat and the partial ester of an edible glycol and a higher saturated fatty acid in a matrix of hydrophilic encapsulating solids of a mixture of these solids and carbohydrates or sugars.

2. A composition according to Claim 1, wherein the encapsulating solids are proteinaceous in nature.

3. A composition as claimed in Claim 1 or 2 in which said partial ester is an ester of propylene glycol and a higher fatty acid, such as propylene glycol monostearate.

4. A composition as claimed in any of Claims 1 to 3 in which said encapsulating solids comprise hydrophilic colloids, if desired together with carbohydrates.

5. A composition as claimed in Claim 4, in which encapsulating solids comprise non-fat milk solids and a sugar.

6. A composition as claimed in Claims 1 to 5, in which the encapsulating solids also have lecithin or hydroxylated or phosphorylated derivatives thereof enclosed therein.

7. A composition as claimed in Claim 6, comprising 30 to 80 parts by weight of fat, 0.5 to 5 parts by weight of hydroxylated lecithin, 5 to 30 parts by weight of non-fat milk solids, 2 to 35 parts by weight of sucrose and 3 to 20 parts by weight of propylene glycol monostearate.

8. A method of making the powdered, free-flowing fat composition according to Claims 1 to 7, which comprises melting the fat together with said partial ester, and with lecithin if used, emulsifying the same in a solution of the encapsulating solids, or a mixture of these solids and carbohydrates or sugars and then effecting spray drying.

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Chartered Patent Agents.
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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1959.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.